MINERALOGY AND PETROGRAPHY.[1]

Petrographical News.—The gabbros of the United States, which, until a few years since, were scarcely known, have recently been studied in typical regions. Prof. Chester[2] has lately communicated the results of his study of the great belt of these rocks crossing the northern part of Delaware and running southwesterly until it unites with that investigated by Williams in the Baltimore area. The rocks of the Delaware region differ from those of the Maryland area in that the former very frequently contain quartz. The normal rock is a hypersthene-gabbro, containing brown hornblende and biotite. This graduates into a more acidic phase by an increase in quartz, and at the same time an equally noticeable gain in biotite, until it becomes more properly a pyroxene-granite than a gabbro. On the other hand, by the increase of brown hornblende, regarded as original, and the assumption of a schistose structure, the normal gabbro grades into a gabbro-diorite or a hornblende-gneiss. Further, uralitization of the pyroxene gives rise to green schistose rocks, identical in nearly all of their characteristics with the gabbro-diorites of the Baltimore region. The author describes in detail each type found by him, and gives analyses of the feldspars of many of them. The plagioclase of the typical diallage-hypersthene gabbros is Ab_1An_2, while that of the more acid biotitic rock is Ab_3An. Gabbro-diorite is the name given to the schistose rock in which brown hornblende predominates over pyroxene. Since the hornblende is regarded as original, there would seem to be no sufficient reason for not calling the rock a diorite-schist, thus reserving gabbro-diorite for those schistose phases of gabbro in which the hornblende is largely secondary. By the loss of nearly all of their pyroxene the gabbro-diorites of both classes pass into hornblende-gneisses. In the gabbro-granites, derived from the gabbros by an increase in quartz and biotite, there are evidences of pressure action in the shattered condition of the quartz and feldspar. Norites, described by the author, are aggregates of quartz and feldspar, in which are imbedded phenocsyts of hypersthene. ——Messrs. Campbell and Brown[3] add two new varieties to the Triassic traps of Virginia, differing from those described from more northern localities in that they contain hypersthene. One is a hypersthene-

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Bull. U. S. Geol. Sur., No. 59.

[3] Bull. Geol. Soc. Amer., Vol. II., p. 339.

diabase, and the other an olivine-hypersthene-diabase. The latter has been found only in one place,—viz., two miles north of Rapidan Station on the Virginia Midland R. R. The hypersthene-diabase occurs not only in various places in Virginia, but it has also been found north. It is slightly ophitic, inclining somewhat to the porphyritic. Its feldspar is a basic labradorite of the formula Ab_2An_5. The pyroxenes are a slightly pleochroic, polysynthetically twinned diallage, and a strongly pleochroic hypersthene. The former contains numerous microlitic inclusions, while the latter is free from them. Quartz, apatite, and green hornblende are accessories. In the olivine rock the olivine is largely idiomorphic, and is in large grains. The other constituents are the same as those of the hypersthene-diabase. The paper contains an excellent series of analyses of the rocks and their most important components.——Barrois[4] has given us a masterly discussion of the diabases and diabase-porphyrites of Silurian age, occurring as dykes and flows in Menez-Hom, Finistère, France. The diabases he divides according to structure into granular and ophitic types. Among the former are olivine-bearing varieties, sometimes containing hypersthene, and olivine-free kinds, containing orthoclase, quartz, and occasionally porphyritic augite. The porphyrites are divided into andesitic varieties in which the feldspar-microlites are older than the augite, and into variolitic kinds with feldspar younger than augite. A large part of the rocks of the region studied occur in the form of tuffs, in which the cementing material is shale, limestone, or sandstone, and the fragments are sometimes large enough to be called bombs. Schalstein is also common. The contact effects noticed in the eruptives are insignificant in amount. The schists in contact with the bedded diabases are spilosites, containing nodules of chlorite. The most interesting contact effects are those noticed in the case of nodules originally consisting of pyroxene and quartz. Under the influence of sea-water made hot by submarine ejections, these nodules have become zonal, in which the two zones differ principally in the size of their constituents, as both contain pyrite, albite, quartz, sphene, and limonite. In conclusion, the author makes some general remarks on the study of ancient volcanoes, and gives quite a good résumé of the work done in this direction.——A dyke of basic rock on Stop Island, in Rainy Lake, Canada, consists of diabase-porphyrite with an almost aphanitic texture on its contact. It contains occasional rounded masses of augite. Four feet from the contact it is a diabase, with the ophitic texture, and at fifteen feet from the contact it is also a diabase. Here, however, a

[4] Bull. Serv. Carte Geol. d. Fr., No. 7, 1890.

portion of the augite is in idiomorphic crystals and in polysomatic grains, while another portion is in allotriomorphic masses between the feldspars. In the middle of the dyke the texture is gabbroitic, while hornblende replaces the augite. Quartz is also a prominent constituent of the center of the dyke, whereas it is only sparingly present at fifteen feet from the contact, and is entirely absent at the contact. Dr. Lawson [5] calls attention to these facts, and states that in the single geological unit represented by the mass of the dyke we must distinguish between three distinct rock types if we make use of present methods of nomenclature. He further thinks that the phenomena indicate that rate of cooling, rather than pressure, is the principal cause determining the textural condition assured by a solidifying magma. Other dykes exhibiting similiar pecularities are described from other localities in the Rainy Lake region. All show larger percentages of SiO_2 in their middle portions than are shown near their contacts,—a fact ascribed to the separation of basic augite, magnetite, etc., in those portions that cooled rapidly.——The larger part of the area of the Dippauer Gebirge in Northwestern Bohemia is covered by basalts, occurring in flows, dykes, and bosses, with their tufas and conglomerates. These are cut by phonolites and andesites, in the former of which are large grains of perofskite, in some cases showing parallel striations in parallel light. The basalts occur in all varieties, according to Clements.[6] The central portions of the hills are composed principally of leucite and nepheline basalts and the closely related rocks, nephelinites, leucitites, nepheline and leucite tephrites, and leucite-basanites. On the peripheries of the mountains are feldspathic basalts, limburgites, and augites. Among the most interesting features of the several rocks noticed are corroded biotite plates, surrounded by rims formed of secondary crystals of the same mineral, in the nepheline basalts; pseudomorphs of phillipsite after olivine in the leucitites; augite crystals with secondary twinning lamellæ produced by pressure in the nephelinites and feldspathic basalts; zonal augites in the leucitites, with an extinction varying gradually from the center to the periphery, and others with the hour-glass structure and an outer zone containing colorless microlites with their long axes lying parallel to the bounding walls of the crystals; and sanidine inclusions surrounded by augite crystals in leucite basalt. Leucite is more abundant in close proximity to an orthoclase inclusion in the last-mentioned rock than elsewhere in the rock-mass. Of the feldspathic basalts it was found that the youngest is most acid.——

[5] *Amer. Geol.*, VII., 1891, p. 153.

[6] Jahrb. d. Kais-Kön. geol. Reichsanst, 1890, XL., p. 317.

Dr. Wolff[7] calls attention to the existence of ottrelite and ilmenite schists among the Paleozoic crystalline rocks of the Taconic region in the Green Mountains and in Massachusetts and Rhode Island. The Rhode Island rocks comprise micaceous schists and graywackes. In the former are grains of quartz, scales of muscovite, and occasional small patches of chlorite and bands of a mixture of graphite and ilmenite. Ottrelite crystals are scattered indiscriminately among the other constituents. In the graywacke the ottrelite occurs in irregular plates, which are free from optical deformities, while the other components of the rock give evidence of having been subjected to intense pressure. Even the mica, which owes its presence to metamorphic agencies, is bent and twisted. The absence of optical deformities in the ottrelite points to a very late origin for this mineral. The author also briefly describes a graphite-schist with ilmenite plates from Rhode Island. All the Rhode Island rocks are known only in boulders.——Singaelia[8] describes specimens of glassy lava from Vesuvius in the cabinet of the University of Berlin. Those from the streams of 1753 and 1809 consist largely of glass in which are tiny perfectly formed crystals of leucite and olivine and good crystals of augite and plagioclase. Other leucites are skeleton crystals, with their edges sharply defined, but their faces hollow. Two other specimens contain glassy portions between crystalline portions. Of these, one from the flow of 1822 contains hornblende, and another, whose age is unknown, has its anorthite and other crystals surrounded by rims of little rutile needles.——The ophiolites of Essex Co., N. Y., and the serpentines from Aqueduct Shaft No. 26, New York city, and from near Easton, Pa., have resulted by metasomatic changes from pyroxene, according to Merrill.[9] In the first-named rock the larger part of the serpentine, which is light green in color, is from a colorless pyroxene. Small particles of a darker-colored serpentine are scattered through the rock, and in these are enclosed graphite scales. Thin sections of these portions show them to consist of calcite, dolomite and serpentine. Originally they were probably composed of the first two minerals only. The serpentine is a subsequent formation, but by what method it was produced the author has not succeeded in determining.——A remarkable example of a Huronian volcanic tufa, from the nickel region at Sudbury, Canada, is reported by G. H. Williams[10] as composed of a glass breccia

[7] Bull. Mus. Comp. Zool., XVI., No. 8, p. 159.

[8] *Neues Jahrb. f. Min.*, etc., B.B. VII., p. 417.

[6] Proc. U. S. Nat. Mus., XII., p. 595; Washington, 1890.

[10] Bull. Geol. Soc. Amer., Vol. II., p. 138.

with its original flowage structure and the shapes of its included fragments well preserved through silicification. Calcite, glassy feldspar, and chlorite are the only minerals, with the exception of quartz and chalcedony, that can still be detected in the rock.——In a report on the iron ores of Minnesota,[11] by Messrs. N. H. and H. V. Winchell, Dr. Hensoldt describes a few of the rocks associated with the ores. Among them are various green schists, jaspers, chalcedony, etc.

Mineralogical News.—*American Minerals.*—Within the last few months a large number of articles have appeared containing the results of investigations of American minerals. Prof. Genth[12] reports some analyses of interesting minerals from the United States and Mexico. Bladed crystalline masses of *tetradymite* from Bradshaw City, Yavapai Co., Ariz., consist apparently of orthorhormbic plates, whose composition corresponds to $Bi_2(S_{1/3}Fe_{2/3})$ [$Bi = 62.23$; $S = 4.50$; $Fe = 33.25$]; so that in all probability the mineral belongs in the stibnite group. *Ziron* from Mars Hill, Madison Co., N.C., yielded him: $SiO_2 = 31.83$; $ZrO_2 = 63.42$; $Fe_2O_3 = 3.23$; Loss $= 1.20$. Its specific gravity is 4.507. Small crystals of *scapolite* associated with garnet at Elizabeth Mine, French Creek, Pa., gave:

SiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	CO_2	Loss	Sp. Gr.
52.30	23.68	.58	.05	12.36	6.29	.77	2.63	1.50	2.675

Both minerals appear to be alteration products of essonite. The garnet is brownish-gray or ash-gray in color. Its composition is given opposite (I.). A titaniferous variety, from the Jones Mine, Henderson Co., N. C., has a composition as opposite (II.):

	SiO_2	Al_2O_3	Fe_2O_3	FeO	Mgo	CaO	MnO	TiO_2	CO_2	Loss	Dens.
(I.)	41.42	18.09	10.81		.59	26.19	.88		1.71	.51	3.390
(II.)	35.56	4.43	20.51	1.88	.17	31.90		4.58		.55	3.738

Analysis of *pyrite* from French Creek, Pa., and of *allanite*, are also given in the same paper. The green substance associated with the gold at Los Cerillos, N. M., supposed to be turquoise, was found in one instance to be *chromiferous clay*, and in another to be *cupriferous quartz*. Pseudomorphs of the latter mineral after stibnite are mentioned by the author as occurring at Durango, Mexico. In another article Prof. Genth[13] gives the result of an examination of *lettsumite* from the Cop-

[11] Bull. No. 6, Nat. Hist. and Geol. Survey of Minn., p. 429.

[12] *Amer. Jour. Sci.*, August, 1890, p. 114.

[13] Ib., p. 118.

per Mountain Mine, near Morenci, Arizona, and from the American Eagle Mine, Copperopolis, Utah. In the first-mentioned locality, the substance forms incrustations of small, blue, fibrous tufts in a quartz gangue. Upon alteration it gives rise to a greenish-yellow, and finally to a fibrous yellowish-white material, often associated with hydrous aluminium sulphate. The Copperopolis specimens are velvety coatings of azure-blue silky fibers on a mixture of clay and lettsumite. The analyses of the two varieties, which are almost identical in composition, lead to the formula $Cu_4Al_2(OH)_{12}SO_4+2H_2O$.

SO_3	CuO	Al_2O_3	Fe_2O_2	H_2O	Ins.	Sp. Gr.
12.49	46.71	16.47	1.34	21.89	.44	2.737

——Crystallized *metacinnabarite* (which has heretofore been found only in amorphous masses) has recently been discovered in the New Almaden Mine, California.[14] The crystals are implanted on quartz containing cinnabar crystals, which in turn occurs incrusting a selvage of clayey material forming an ore seam, whose origin is referred to solfataric action on the country rock. Spheres of a black organic substance are imbedded in the metacinnabarite, whose density is 7.118. Its composition follows:

S	Hg	Fe	Co	Zn	Mn	$CaCO_3$	Quartz	Org. Matter
13.68	78.01	.61	tr.	.90	.15	.71	4.57	.63

The crystals are rhombohedral and hemimorphic,with an acute pyramidal habit, and an axial ratio $a:c=1:.2372$.——In rotted galena on a contact between limestone and mica-schist at Mountain View Lead Mine, near Union Bridge, Md., Williams[16] has found small but good crystals of *anglesite* and *cerussite*, and a single crystal of *sulphur*, all of which are products of the decomposition of the lead ore. The three principal types of the anglesite are prismatic, parallel to the brachy-axis, with $P\breve{\infty}$ and $P\breve{2}$ predodominating, cuboidal, with $P\breve{\infty}$ and $\infty P\bar{\infty}$ the principal forms, and prismatic in the direction of the macro-axis, with $\frac{1}{4}P\bar{\infty}$ determining the habit. The cerussite presents a great variety of habits. One elbow twin is peculiar in that each of the two individuals is bounded on the inner side by $\infty P\breve{\infty}$, while the outer side contains in addition the brachy-domes $\frac{1}{2}P\breve{\infty}$, $P\breve{\infty}$, and $2P\breve{\infty}$. The sulphur crystal is very small, but it contains thirteen forms, of which eight are in the zone of the ground-pyramid and one $\frac{3}{5}P$ is new. ——The *polycrase* reported by Messrs. Hidden and Mackintosh[16] as oc-

[14] Melville. Ib., Oct., 1890, p. 291.

[15] Johns Hopkins Univ. Circ., No. 87.

[16] *Amer. Jour. Sci.*, June, 1890, p. 302.

curring four miles from Marietta, S. C., and in Henderson Co., N. C. has been examined by these gentlemen, who find it forming tabular crystals with $\infty P\bar{\infty}$ largely developed, and the new forms oP, $\frac{1}{3}P\bar{\infty}$, and $\breve{P}\frac{3}{2}$ occurring on it. Several of the crystals are apparently twins, and those from South Carolina, when doubly terminated, appear to be both hemihedral and hemimorphic. The material for analysis was obtained by washing kaolinized coarse granite. This, when corrected for impurities, yielded:

	Cb_2O_5	TiO_2	Y_2O_3 (etc.)	FeO	UO_3	PbO	Fe_2O_3	CaO	H_2O	Ins.	SiO_2
N. C.	19.48	29.31	27.55	2.87	13.77				5.18		
S. C.	19.37	28.51	21.23	2.47	19.47	.46	.18	.68	4.46	.12	1.01

Prof. Rowland, to whom the South Carolina specimens were submitted for microscopic study, found in them large amounts of scandium.——The same investigators[17] have examined lemon-yellow *auerlite* from Price's Land, Henderson Co., N. C., and a few other rare minerals. The auerlite has a density of 4.051–4.075, and a composition: $P_2O_5 = 8.58$; $SiO_2 = 6.84$; $ThO_2 = 72.16$ (diff.); $Fe_2O_3 = 1.78$; $H_2O = 10.64$. *Sulphohalite* they find to be probably tetrahedrally hemihedral. The *fayalite*[18] of Cheyenne Mt., Colorado, occurs sometimes in the granite in masses weighing as much as ten pounds. Analysis: $SiO_2 = 27.66$; $FeO = 65.79$; $MnO = 4.17$; $CaO = .47$. Mr. Hidden[19] also announces the discovery of *bastnaesite* and *tysonite*, near Manitou, Colorado, in a mass weighing over six kilograms, and gives four new localities for the occurrence of *fergusonite*, as follows: Associated with allanite, at Amelia Court House, Virginia; accompanying zircon, in the mines at Storeville, Anderson Co., South Carolina; at the Grassy Creek Mica Mine, in Mitchell Co., N. C.; and in the gold placers near Golden, Rutherford Co., N. C. The *orangite* of Landbö, Norway, is declared to be *uranothorite*. Its density is 4.322. A partial analysis gave 11.97 per cent. H_2O; 18.50 per cent. SiO_2; 52.53 per cent. ThO_2; 9 per cent. UO_3, and small quantities of other substances.——Associated with beryl and spodumene in the granite of the Nickel Plate tin claim, in Pennington Co., South Dakota, are nodules of a phosphate near *triphyllite* in composition. It is dark green in mass, and light yellowish-green in thin splinters. Its hardness is 5, and density 3.612. Analysis[20] yielded:

P_2O_5	FeO	MnO	CaO	MgO	Na_2O	K_2O	Li_2O	F	Ign.	Gangue
38.64	25.05	15.54	5.53	1.50	7.46	2.00	.28	.69	.73	2.47

[17] Ib., May, 1891, p. 438.

[18] Cf. *Amer. Jour. Sci.*, March, 1885, p. 25.

[19] Ib., p. 439.

[20] Headdon. *Amer. Jour. Sci.*, May, 1891, p. 416.

——Penfield[21] has analyzed an *aurichalcite*, occurring in narrow seams in an impure limonite from Utah, which yielded an average:

CO_2	CuO	ZnO	H_2O	CaO	Dens.
16.36	19.37	53.09	9.92	.61	3.57 $= 2RCO_3 3R(OH)_2$,

in which R = Zn and Cu, with CuO:Zno = 2:5.——Inexhaustible beds of *beauxite* have been discovered near Little Rock, Arkansas, and near Benton in the same state. According to Branner[22] they are genetically related in some unknown way with eruptive granites. The material is pisolitic in structure. A partial analysis of one specimen gave: $Al_2O_3 = 55.64$; $SiO_2 = 10.38$: $Fe_2O_3 = 1.95$; $TiO_2 = 3.50$; Loss $= 27.62$.——An analysis of *halotrichite* from Pitkin Co., Colorado, is given by Bailey[23] as follows:

SO_3	Al_2O_3	Fe_2O_3	FeO	MgO	H_2O at 100°	H_2O at over 100°
33.46	12.98	1.60	5.18	.17	33.10	12.94

——Farrington[24] has carefully examined the Arizona *azurites*, on which he finds the new forms $\frac{2}{3}P$, $\frac{4}{7}P$, $3P\frac{3}{2}$ and $\frac{12}{5}P\frac{6}{5}$. Four distinct types of crystals are recognized; one is pyramidal with 2P predominant. The others are prismatic, dome-like, and lath-shaped. The latter came from the Longfellow Mine, and are peculiar for their ortho-diagonal elongation and the large development of the orthodome $P\overline{\infty}$. The axial relation calculated from the measurements of the different types is $a : b : c = .85676 : 1 : .88603$; $\beta = 87°36'36''$——The very rare mineral *pollucite* has just been reported by Wells[25] as associated with quartz crystals aud clay, and with psilomelane and a nearly colorless calcium beryl at Hebron, Maine. The pollucite is in irregular fragments, perfectly colorless, and as brilliant and transparent as plate glass. Its index of refraction for sodium light is 1.5247, and its density = 2.976–2.985. Its analysis gave:

H_2O	SiO_2	Al_2O_3	CaO	Cs_2O	K_2O	Na_2O	Li_2O
1.50	43.51	16.30	.22	36.10	.48	1.68	.05

corresponding to $H_2R'_4Al_4(SiO_3)_9$, with which formula all the analyses of the Elba mineral may likewise be made to agree.——*Columbite*[26] crystals from the Bob Ingersoll Claim and the Etta Mine in the Black Hills have a tabular habit with $\infty P\overline{\infty}$ predominating.——Snow[27] reports the occurrence of *turquoise* at several ancient workings near Silver City, Grant Co., New Mexico.

[21] Ib., Feb., 1891, p. 105.
[22] *Amer. Geol.*, VII., 1891, p. 181.
[23] *Amer. Jour. Sci.*, April, 1891, p. 296.
[24] Ib., p. 300.
[25] Ib., p. 213.
[26] Blake. Ib., May, 1891, p. 403.
[27] Ib., June, 1891, p. 511.